

Quiz 5, Calculus III – Computers needed

Dr. Graham-Squire, Fall 2013

Name: _____

1. (5 points) Let L be the lamina bounded by the graphs $x = 9 - y^2$ and $x = 0$, with density function given by $\rho(x, y) = x^2$.
 - (a) Sketch a graph of the region. Given your knowledge of the shape of the lamina and the density function, estimate where the center of mass (\bar{x}, \bar{y}) will lie. You can write your answer in coordinates or just place a dot somewhere on the lamina. Make sure to explain your answer.
 - (b) Set up integrals to find the unknown values from part (a). Use Sage/Maple (or do by hand) to calculate the center of mass to see how close your estimate was from part (a).

2. (5 points) (a) Set up (but do not evaluate) a triple integral to determine the volume of the 3-dimensional region lying inside the sphere $x^2 + y^2 + z^2 = 4$ but outside the cylinder $x^2 + y^2 = 1$. You can set up the integral in whatever coordinate system you see fit.
- (b) Will you be able to integrate your triple integral by hand? Explain why or why not.
- (c) Use Sage/Maple to evaluate the integral, or integrate it by hand (if you can). Does your answer make sense? Note that the volume of a sphere is given by $V = \frac{4}{3}\pi r^3$ and the volume of a cylinder is $V = \pi r^2 h$.